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Exploring for Life Under the Ice

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The possibility that there is or has been an ocean on Europa opens the question of life on Europa. The Jet Propulsion Laboratory, California Institute of Technology, is developing an "Antarctica as a Europa Analog" initiative. This proposed program will develop vehicles, instruments and techniques to explore and look for possible life in Lake Vostok, Antarctica, and in time evolve these for application on Europa.

Ice thickness distribution is an important parameter in terrestrial sea ice, where the ice can vary from a few centimeters to many tens of meters. Also, the makeup of the sea ice can vary with its thickness. New, thin ice may have a lot of brine, and older, thicker ice may be much fresher. The mechanics which control terrestrial sea ice thickness distribution may also control the thickness distribution of the ice on Europa. In terrestrial sea ice, the thickness is controlled by multi-step processes such as ice fracture from thermal or tidal stress, opening by mechanical forces from wind and ocean currents, freezing of the ice and its redistribution in rafting and ridging in compression or shear caused by winds and ocean currents. These processes produce ice features which can be recognized and used to judge relative ice thickness. Using features on Europa which resemble those on terrestrial sea ice, it may be possible to judge the relative thickness distribution of the ice on Europa. This terrestrial sea ice analogy can be used to aid in the choice of sites for possible ice penetration on Europa.